Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$\tan\left[\tan^{-1}\frac{x}{\alpha}+\tan^{-1}\frac{x}{\beta}+\tan^{-1}\frac{x}{\gamma}+\ldots+\tan^{-1}\frac{x}{\nu}\right].$$

$$=\frac{x\,\Sigma\frac{1}{\alpha}-x^3\,\Sigma\frac{1}{\alpha\beta\gamma}+x^5\,\Sigma\frac{1}{\alpha\beta\gamma\delta\varepsilon}-\ldots}{1-x^2\,\Sigma\frac{1}{\alpha\beta}+x^4\,\Sigma\frac{1}{\alpha\beta\gamma\delta}-\ldots}=0\ldots(3);\text{ for}$$

$$\Sigma\frac{1}{\alpha}\equiv\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}+\frac{1}{\delta}+\ldots=\frac{\beta\gamma\delta\varepsilon\ldots+\alpha\gamma\delta\epsilon\ldots+\alpha\beta\delta\epsilon\ldots+}{\alpha\beta\gamma\delta\varepsilon\ldots}.$$

The numerator of this fraction is the sum of the roots taken one less than all at a time, and is therefore equal to the coefficient of x which in equation (2) is zero, and the denominator is the product of the roots which in (2) is the known term, $m-n$. Hence, $\Sigma\frac{1}{\alpha}=0$. Similarly, $\Sigma\frac{1}{\alpha\beta\gamma}$ is a fraction whose numerator is the sum of the products of the roots taken three less than all at a time, and is therefore the coefficient of x^3 in (2), which is 0. Hence, $\Sigma\frac{1}{\alpha\beta\gamma}=0$. Similarly, for the other terms of the numerator of (3). From similar considerations, $\Sigma\frac{1}{\alpha\beta}$, $\Sigma\frac{1}{\alpha\beta\gamma\delta}$, $\ldots\neq0$.

Hence, $\tan\Sigma\left(\tan^{-1}\frac{x}{\alpha}\right)=0$. Hence, $\Sigma\tan^{-1}\frac{x}{\alpha}=n'\pi$ where n' is any integral positive or negative number.

Also solved by G. B. M. Zerr, and V. M. Spunar.

301. Proposed by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

A is at Philadelphia, B at Chicago. A's personal equation is e; B's is E. When a star crosses A's meridian at time $t_1=8$ hours, 33 minutes, 24 seconds, he presses a button, telegraphing the fact to B, who receives it at time $t_2=7$ hours, 43 minutes, 23 seconds. When it crosses B's meridian at time $T_2=8$ hours, 33 minutes, 10 seconds, he telegraphs A, who receives it at time $T_1=9$ hours, 23 minutes, 11 seconds. They now exchange places, and on the second day following, B observes the transit at time $t'_1=8$ hours, 33 minutes, 26 seconds, and A gets the information at Chicago at time $t'_2=7$ hours, 43 minutes, 25 seconds. It crosses A's meridian at time $T'_2=8$ hours, 33 minutes, 12 seconds, and B gets the information at time $T'_1=9$ hours, 23 minutes, 13 seconds. Find the difference of longitude between Philadelphia and Chicago.

Solution by the PROPOSER.

The true times of the two transits at Philadelphia are t_1+e and T_1.

Hence, difference of time between Philadelphia and Chicago is $D=T_1+\ldots-t_1-e\ldots(1)$.

The true times of the two transits at Chicago are T_2+E and t_2.

Hence. $D=T_2+E-t_2$...(2).

(1)+(2) gives $2D=T_1+T_2-t_1-t_2+E-e$...(3).

Similarly, when A and B have changed places, $2D=T'_1+T'_2-t'_1-t'_2-E+e$...(4).

¼(3)+(4) gives $D=\frac{1}{4}(T_1+T_2+T_1+T_2-t_1-t_2-t'_1-t'_2)$. Substituting the values of the T's and t's, we have

$D=\frac{1}{4}$(3 hours, 19 minutes, 8 seconds)=49 minutes, 47 seconds, and $L=15D=12^\circ\ 26'\ 45''$, the difference of longitude.

Also solved by V. M. Spunar.

GEOMETRY.

335. Proposed by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

Determine analytically, the point where three lines in a plane appear of equal length.

Solution by the PROPOSER.

In the most general solution we can take the rectangular axes of coordinates so that the axis of abscissas agrees, in direction, with one of the lines. Let this line be given by (0, 0); (a, 0); the second and third lines are then represented by the coordinates (b, c); (d, f), and (h, k); (m, n), respectively. Also let (x, y) be the point where they appear equal. The tangent of the angle formed by the lines through (x, y); (b, c) and (x, y); (d, f) is

$$\frac{\dfrac{c-y}{b-x}-\dfrac{f-y}{d-x}}{1+\dfrac{(c-y)\ (f-y)}{(b-x)\ (d-x)}}=\frac{cd-bf+(f-c)x+(b-d)y}{bd+cf-(b+d)x-(c+f)y+x^2+y^2}.$$

With similar expressions for the other lines.

$$\therefore\ \frac{ay}{ax-x^2-y^2}=\frac{cd-bf+(f-c)x+(b-d)y}{bd+cf-(b+d)x-(c+f)y+x^2+y^2}\ldots(1).$$

$$\frac{ay}{ax-x^2-y^2}=\frac{km-hn+(n-k)x+(h-m)y}{hm+kn-(h+m)x-(k+n)y+x^2+y^2}\ldots(2).$$

$$\begin{aligned}\therefore\ (f-c)x^3&+(cd-bf+ac-af+by-dy+ay)x^2\\&+(abf-acd-2aby+fy^2-cy^2)x+(abd+acf)y\\&+(cd-bf-ac-af)y^2+(a+b-d)y^3=0\ldots(3).\end{aligned}$$